International BTEC Applied Science – Summer transition work

What is BTEC Applied Science?

BTEC Applied Science is widely recognised qualification by industry and universities. The course enables students to study biology, chemistry and physics post 16 using a combination of exams and coursework for assessment. The course is equivalent to one A level and is usually studied either alongside other BTEC qualifications or A levels. The BTEC Applied Science course covers various topics from each of the three sciences including cell biology, waves and the electronic structure of atoms. In addition, there is strong focus on the investigative skills used in science, and students will be expected to plan and carry out experiments and then evaluate the outcomes.

Why should I study BTEC Applied Science?

BTEC Applied Science develops students' knowledge across all three sciences. Students study biology, chemistry and physics in greater depth than at GCSE. In addition, the practical side of the course develops student's laboratory skills and this in turn leads to them improving their analytical skills and their ability to plan and evaluate scientific experiments. Finally, the BTEC Applied Science helps students learn time management skills given they work to deadlines from the very start of the course (there is no leaving it to the last minute) in order to complete coursework.

BTEC Applied Science is fundamentally an experimental subject, BTEC Applied Science provides numerous opportunities to use practical experiences to link theory to reality and equip students with the essential practical skills.

What careers could BTEC Applied Science lead to?

BTEC Applied Science could lead to any number of careers. The course develops a full range of skills so that it works alongside other BTEC qualifications and A levels. Significant numbers of students may choose to find careers in health care including nursing, midwifery, physiotherapist, health care workers and paramedics.The qualification is ideal for those looking for a career in education and can be a steppingstone to primary or secondary teaching, early years teacher and nursery nurse.

The strong emphasis on practical skills means students can look to use BTEC Applied Science as a step onto becoming a laboratory technician or a forensic scientist.Some students study BTEC Applied Science to move into sports science, including becoming personal trainers, sports coach, fitness trainer or nutritionist.

Activities

Identifying ions

Part 1: Identifying ions

Below is a list of ions.

Carbonate	Hydroxide	Chloride	Oxide
Copper (II) ion	Calcium ion	Nitrate	Silver(I) ion
Barium ion	Lithium ion	Aluminium ion	Sodium ion
Sulphate	Iodide	Hydrogen carbonate	Phosphate
Hydrogen ion	Magnesium ion	Fluoride	Ammonium

Match the name from the table above to the ion.

Ion	Name
I^-	
NH_4^+	
^-OH	
F^-	
CO_3^{2-}	
NO_3^-	
SO_4^{2-}	
Li^+	
Al^{3+}	
Cl^-	
HCO_3^-	
Ca^{2+}	
Cu^{2+}	
H^+	
Mg^{2+}	
Ag^+	
PO_4^{3-}	

Activities

Part 2: Molecular formula of ionic compounds

Use the table above to work out the formula of the compounds from the name. Remember, the charges must balance so you need to have an equal number of +ive and –ive charges.

Name	Ions present	Molecular formula
Calcium chloride	Ca^{2+} and 2 x Cl^-	$CaCl_2$
Potassium hydroxide		
Aluminium chloride		
Magnesium carbonate		
Ammonium fluoride		
Copper (II) chloride		
Potassium carbonate		
Magnesium fluoride		
Sodium hydrogen carbonate		
Silver nitrate		
Magnesium hydrogen carbonate		
Lithium iodide		
Calcium hydroxide		

Ionic bonding diagrams

Draw ionic bonding diagrams of the following compounds

a) Lithium hydride (LiH)	b) Potassium fluoride (KF)
c) Magnesium oxide (MgO)	d) Calcium chloride ($CaCl_2$)
e) Calcium sulphide (CaS)	f) Sodium sulphide (Na_2S)
g) Sodium nitride (Na_3N)	h) Aluminium fluoride (AlF_3)

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Cell Biology

Task 1: Use the internet and find or draw a large diagram of a typical plant and animal cell.

Label the nucleus, 80S ribosomes, cellulose cell wall, mitochondria, cytoplasm, permanent vacuole, rough endoplasmic reticulum, smooth endoplasmic reticulum, Golgi apparatus centrioles & chloroplasts (Not all are in both cells).

Task 2: Annotate their functions.

Task 3: Find a diagram of a prokaryote and label the nucleoid, cytoplasm, cell membrane, slime capsule, cells wall, 70S Ribosomes, plasmids and flagellum.

Task 4: Annotate their functions.

Task 5: What is a prokaryote cell and what is a eukaryote cell?

ii) Which cells are examples of which?

iii) What are the differences in their organelles?

Task 5: Find and label diagrams of muscle cells, egg cells, White blood cells, red blood cell, root hair cell and sperm cells. For each one write a sentence to explain the function of the cell.

Animal and Plant Cells

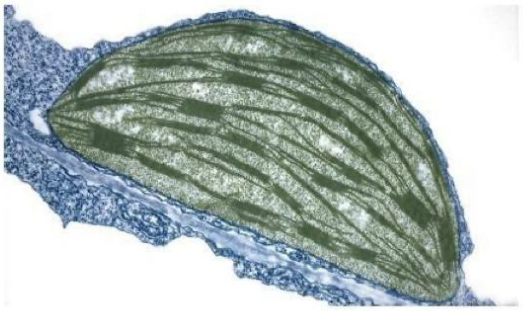
1. Look at the table below. How many structures inside plant and animal cells can you name?

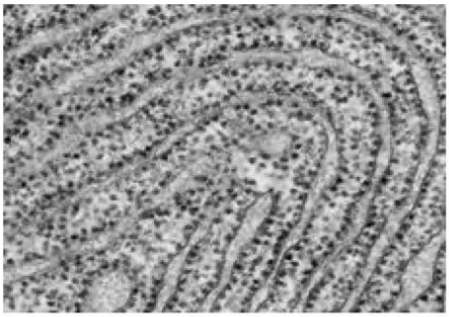
Plant Cells – name 18	Animal Cells – name 12

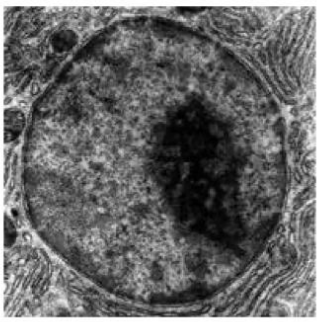
2. Why don't animal cells contain chloroplasts?

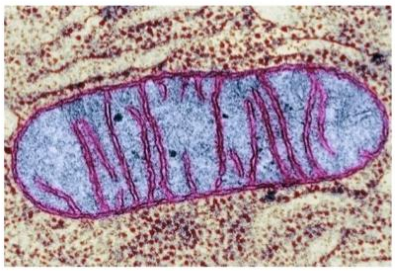
3. Write a short essay on 'The similarities and differences between animal and plant cells.'

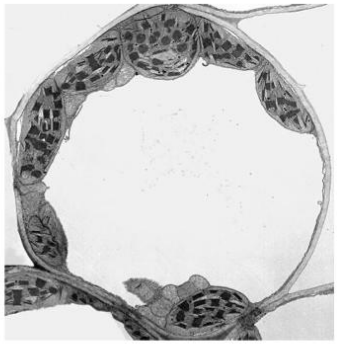
4. Identify the following structures. Some images may have more than one structure to identify. For each one describe its structure and function and whether it is present in plant cells, animal cells or both.











Introduction to Waves Worksheet

LOs

- Describe the main features of waves
- Distinguish between longitudinal and transverse waves

Key Words: (Select 5 or more keywords)

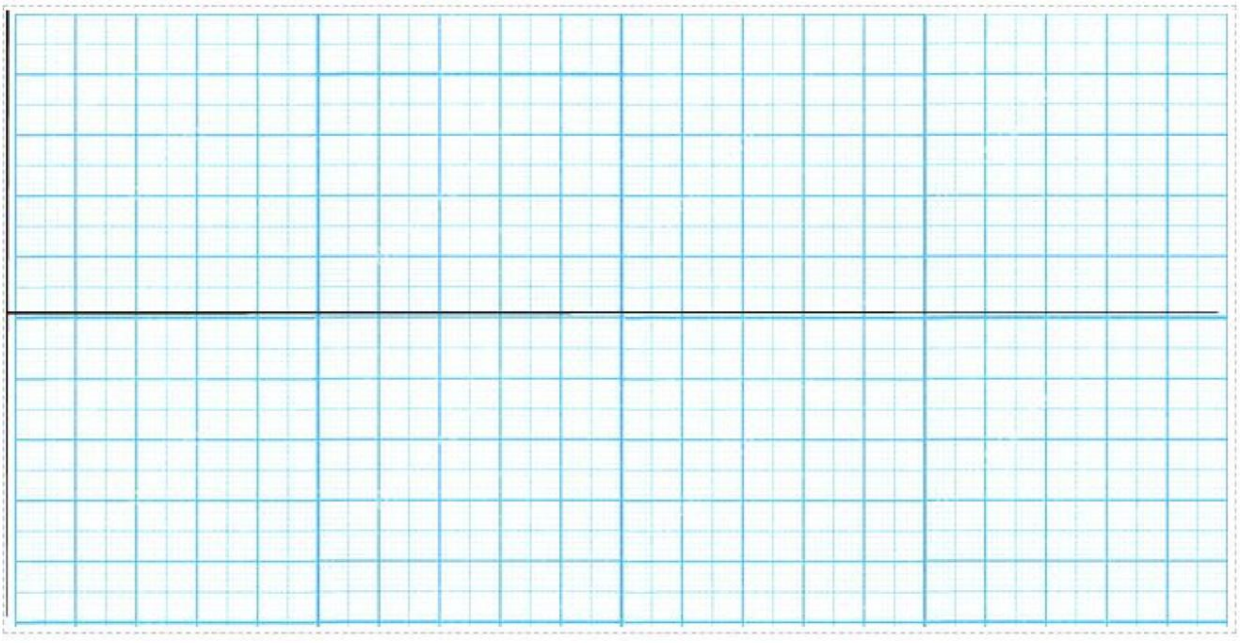
1) Sketch a transverse wave in the box below:

	Examples of transverse waves:

2) Sketch a longitudinal wave in the box below:

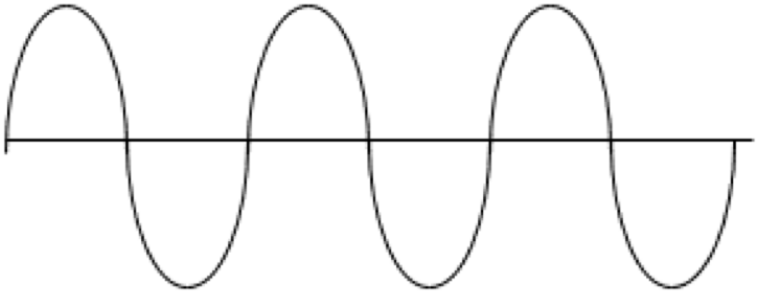
	Examples of longitudinal waves:

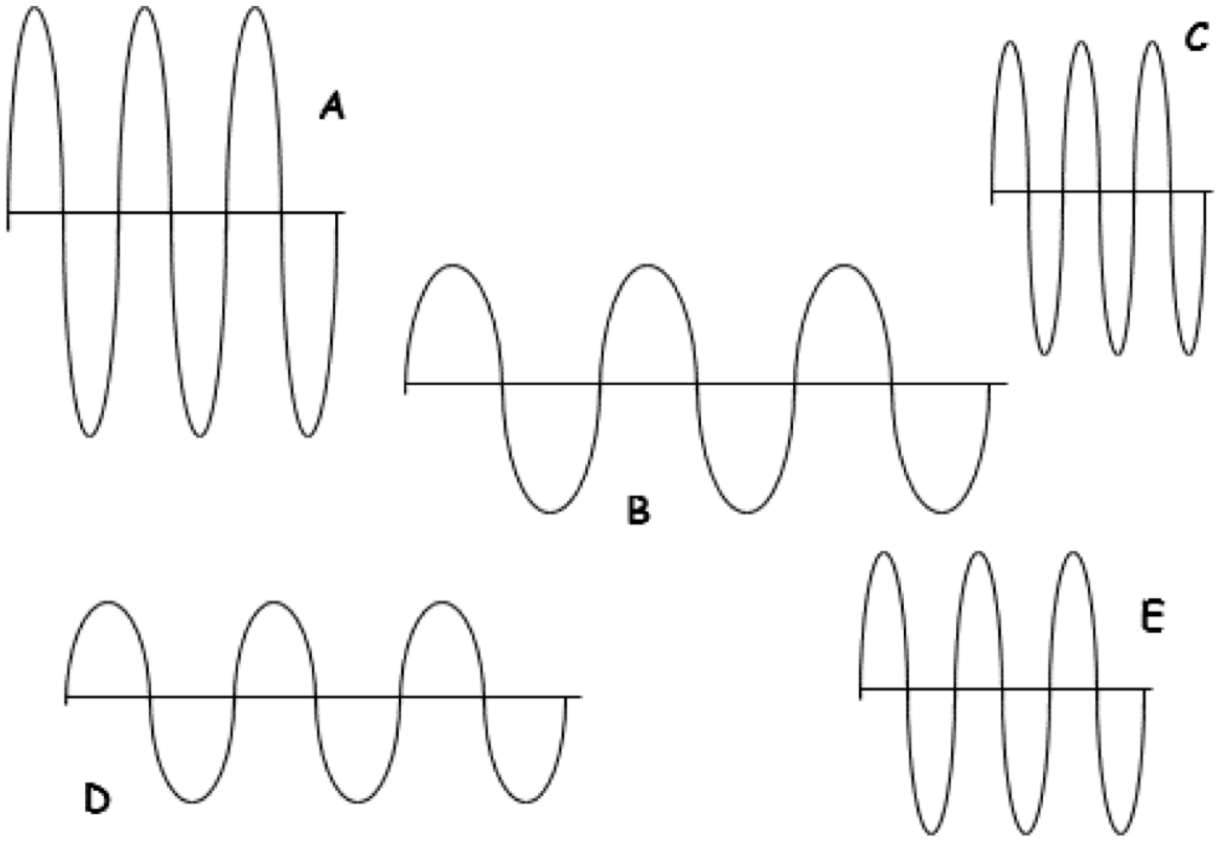
3) Draw and label a wave diagram in the area below:



Waves

Label the amplitude and wavelength for each of the waves below. Once you have done this, answers the questions at the bottom of the worksheet in your book.





Which of the above waves has: **(NB You might need a ruler!)**

The highest frequency?

The shortest wavelength?

The largest amplitude?

The longest wavelength?

The lowest pitch?

The loudest intensity?

The smallest amplitude?

Measuring waves

The formula for calculating wave speed is

Wave speed = frequency x wavelength

(metres per second, m/s) (hertz, Hz) (metre, m)

(v) = (f) x (λ)

1. Using the equation above can you fill in the table to calculate the different **wave speeds**?

Remember to change units of wavelength into meters if they are in cm.

Frequency (Hz)	Wavelength (cm)	Wavelength (m)	Wave speed (m/s)
10 Hz	10 cm	0.1	
2.5 Hz	10 cm		
30 Hz	2 cm		
50 Hz	1 cm		
200 Hz	-	10	
1000 Hz	-	5	

2. Rearrange the equation at the top of the page so you can calculate **wavelength** from **frequency** and **wave speed**?

ii) Use your re-arranged equation to calculate the wavelength of the waves and fill in the table?

Wave speed (m/s)	Frequency (Hz)	Wavelength (m)
0.6	24	
0.6	30	
0.6	12	
0.6	20	

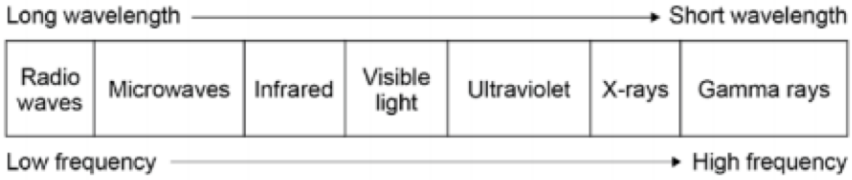
3.) Rearrange the equation so you can calculate **frequency** from **wavelength** and **wave speed**?

ii) Use your re-arranged equation to calculate the frequency of the ocean waves and fill in the table?

Wave speed (m/s)	**Wavelength (m)**	**Frequency (Hz)**
1.5 (m/s)	**0.75**	
1.2 (m/s)	**0.4**	
4 (m/s)	**0.5**	
3 (m/s)	**0.3**	

Electromagnetic Waves

Electromagnetic _____ are transverse waves that transfer _____ from the source of the waves to an absorber. Electromagnetic waves form a continuous spectrum and all types of _____ wave travel at the same velocity through a vacuum (space) or air. The waves that form the electromagnetic spectrum are grouped in terms of their _____ and their frequency. Going from long to short wavelength (or from _____to high frequency) the groups are: radio, _____, infrared, visible light (red to violet), _____, X-rays and gamma rays.



Our eyes only detect visible _____ and so detect a limited range of electromagnetic waves.

Radio waves	Cooking food, electrical heaters, infrared cameras.
Microwaves	Energy efficient lamps, sun tanning
Infrared	Medical imaging and treatments
Visible light	Television and radio.
Ultraviolet	Sterilising medical equipment.
X-rays	Satellite communications and cooking food
Gamma rays	Fibre optic communications